

Applicant: Stager et al.
Application No.: 10/772,643

Amendments to Drawings:

The attached sheet of drawings includes changes to Figure 9. This sheet, which include Figures 9 and 10, replaces the original sheet including Figures 9 and 10. In Figure 9, typographical errors have been corrected in box 504 (changing “data” to “delta” and “(TS)” to “T(S)”) and in box 508 (changing “data” to “delta”).

REMARKS/ARGUMENTS

After the foregoing amendments, claims 1-18 and 20-34 are currently pending in this application. Claim 19 has been canceled without prejudice. Claims 1-14 and 16-18 have been amended to further clarify the features of the present invention. Claims 20-34 have been added to further define the present invention. Applicants submit that no new matter has been introduced into the application by these amendments.

Objections to the Drawings

The Examiner objected to the drawings because they include the following reference characters not mentioned in the description: Figure 7, step 414. Paragraph 0052 of the specification has been amended to insert this reference number. The withdrawal of the objection to the drawings is respectfully requested.

Claim Rejections - 35 USC §112

Claims 5 and 9 stand rejected under 35 U.S.C. §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

Claims 5 and 9 have been amended to correct the antecedent basis problem. Withdrawal of the 35 U.S.C. §112 rejection of claims 5 and 9 is respectfully requested.

Claim Rejections - 35 USC §101

Claims 1 and 10 stand rejected under 35 U.S.C. §101 because the disclosed invention is inoperative as including mental steps and therefore lacks utility.

Claims 1 and 10 have been amended to further clarify the operation of the present invention. Based on these amendments, it is clear that the methods do not include any mental steps. Withdrawal of the 35 U.S.C. §101 rejection of claims 1 and 10 is respectfully requested.

Claim Rejections - 35 USC §102(e)

Claims 1-19 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,725,331 to Kedem (hereinafter “Kedem”).

Kedem relates to a method and apparatus for managing dynamic assignment of physical resources in a data storage system (column 2, lines 13-17). An example of a dynamic assignment of a physical resource is utilizing a storage device as a “hot spare” to replace a failing storage device (column 1, lines 58-61). Kedem utilizes pairs of disk adapters to control drives; in the event of a failure of one adapter of the

pair, the other can take over (column 4, lines 53-56). The adapters use configuration tables to track system resources, such as disk adapter number, logical volume number, and mirror number (column 3, line 53 to column 4, line 8 and column 5, lines 1-18).

As described in column 6, lines 7-25:

A DC/BCV volume can be used to establish a logical “connection” with another logical volume. The DC/BCV volume is used to make at least one additional copy or mirror of the logical volume to which it is logically connected. After the copy is made, the storage system may de-establish the connection to create a snapshot of the contents of the copied logical volume at a particular point in time. The snapshot copy can then be used to perform various operations (e.g., making a backup of the data or generating a report based on its contents) without disrupting or holding up access to the logical volume that was copied. When the desired operations have been completed, the logical connection between the DC/BCV logical volume and the copied logical volume may be reestablished, so that the DC/BCV volume can be updated with all changes that occurred to the copied volume while the logical connection had been de-established. In this manner, the DC/BCV volume can be used to provide a copy of the logical volume at a later point in time.

Because the DC/BCV is disconnected from the logical volume for periods of time, the DC/BCV is not able to provide continuous data protection as recited in the present application. The “snapshot” as used by Kedem is used to perform operations that would otherwise disrupt access to the logical volume. In contrast, a “snapshot” as defined by the present application is used to restore the system to a particular point in time.

To manage the dynamic assignment of resources in a storage system, Kedem discloses a method of creating a global table to store information on all dynamic resource assignments in the system, creating a local table in each controller which includes a copy of the global table, and controlling the dynamic assignment of resources using the local table (column 9, line 55 to column 10, line 3).

The Examiner's arguments based on Kedem are not supportable by Kedem. First, the Examiner argues that column 5, line 66 to column 6, line 4 of Kedem discloses continuous data protection. As discussed above, reading further down column 6 describes that the DC/BCV is not always connected to the logical volume which it copies; therefore, the data protection cannot be continuous.

Second, there is no mapping of the writes between the primary volume and the secondary volume, as recited in claims 10 and 14. The Examiner argues that the entries in the GDAT/LDAT table are used to track the writes. The GDAT table is the global table that is used to track the resource assignments, and only includes information such as disk adapter number, logical volume number, and mirror number. The particular writes that are made are not tracked by Kedem in any way.

Third, the Examiner argues that column 6, lines 11-25 of Kedem discloses that the primary volume may be restored to any previous point in time. This position is clearly contradicted by the plain meaning of the language cited by the Examiner; Kedem states that "the DC/BCV volume can be used to provide a copy of

the logical volume at a later point in time." (Column 6, lines 23-25, emphasis added.) A later point in time is not the same as any point in time. Kedem fails to address the situation of what happens between the time a copy is made to the DC/BCV and the later point in time; the present application is directed to addressing this situation by providing continuous data protection.

In regard to claim 1, Kedem fails to disclose all of the elements of claim 1 and therefore cannot be used to anticipate claim 1. In particular, Kedem fails to disclose the steps of duplicating the writes made to the primary volume to a secondary volume in a sequential fashion, wherein the secondary volume contains a chronological ordering of all writes made to the primary volume; and identifying an APIT window wherein all writes to the secondary volume are maintained so that within the identified APIT window, the primary volume may be restored to any previous point within the APIT window. As noted above, Kedem does not duplicate all writes continuously, nor does Kedem permit the primary volume to be restored to any previous point within a designated time window. Therefore, claim 1 is distinguishable over Kedem. Because claims 2-9 depend from claim 1, claims 2-9 are also distinguishable over Kedem without the need for additional comment.

In regard to claim 10, Kedem fails to disclose all of the elements of claim 10 and therefore cannot be used to anticipate claim 10. In particular, Kedem fails to disclose the steps of duplicating the writes to the primary volume in a sequential fashion on a secondary volume, wherein the secondary volume contains a chronological ordering of all writes made to the primary volume; organizing a mapping of the writes between the primary volume and the secondary volume into data structures, wherein the data structures enable the primary volume to be restored to any point in time; and identifying an APIT window wherein the data structures are maintained so that within the identified time window, the primary volume may be restored to any point within the time window. As noted above, Kedem does not duplicate all writes continuously, nor does Kedem map the writes between the primary volume and the secondary volume, nor does Kedem permit the primary volume to be restored to any previous point within a designated time window. Therefore, claim 10 is distinguishable over Kedem. Because claims 11-13 depend from claim 10, claims 11-13 are also distinguishable over Kedem without the need for additional comment.

In regard to claim 14, Kedem fails to disclose all of the elements of claim 14 and therefore cannot be used to anticipate claim 14. In particular, Kedem fails to disclose that the secondary volume contains a chronological ordering of all writes made to the primary volume; and a mapping of the data between the primary

Applicant: Stager et al.
Application No.: 10/772,643

volume and the secondary volume using data structures, wherein the data structures are maintained so that within an established time window, the primary volume may be restored to any point within the time window. Therefore, claim 14 is distinguishable over Kedem. Because claims 15-18 depend from claim 14, claims 15-18 are also distinguishable over Kedem without the need for additional comment.

Based on the arguments presented above, withdrawal of the 35 U.S.C. §102(e) rejection of claims 1-19 is respectfully requested.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

Applicant: Stager et al.
Application No.: 10/772,643

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1-18 and 20-34, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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